General Surgery Education Across Three Continents

Craig McIlhenny, MBChB,[1] Yo Kurashima, MD, PhD,[2] Carlos Chan, MD,[3]

Satoshi Hirano, MD, PhD,[2] Ismael Domínguez-Rosado, MD,[3] Dimitrios Stefanidis, MD, PhD [4]

[1] Royal College of Surgeons of Edinburgh, Edinburgh, UK

c.mcilhenny@nhs.net

[2] Department of Gastroenterological Surgery II, Hokkaido University Faculty of Medicine, Sapporo, Japan

yo.kurashima@huhp.hokudai.ac.jp;

satto@med.hokudai.ac.jp

[3] National Institute of Nutrition and Medical Sciences, Salvador Zubirán, México City, México

chancarlos@me.com

ismaeldominguez83@gmail.com

[4] Indiana University, School of Medicine, Indianapolis, IN

Corresponding Author: Dimitrios Stefanidis, MD, PhD

Indiana University Department of Surgery

545 Barnhill Drive, EH 125

Indianapolis, IN 46202

dimstefa@iu.edu 317-274-2304

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Introduction

Surgical education has seen tremendous changes in the US over the past decade. The Halstedian training model of see one, do one, teach one that governed surgical training for almost 100 years has been replaced by the achievement of the Accreditation Council for Graduate Medical Education (ACGME) competencies, milestones, entrustable professional activities (EPAs), and acquisition of surgical skill outside the operating room on simulators (1). Several of these changes in American medical education have been influenced by educators and training paradigms abroad. The training model that Halsted implemented and has served as the backbone for the education of generations and generations of US surgeons was influenced by Halsted's experiences with the German training system (2). Further, the most recent paradigm shift in education was the development of EPAs by Olle ten Cate in the Netherlands. (3) These examples provide evidence that the exchange of ideas among educators from different countries has the potential to significantly influence training. In an effort to promote the exchange of ideas and discussion among surgical educators from around the world, the Association for Surgical Education in its 2017 annual meeting invited reputable surgical educators from three different continents to participate in a panel that led to a lively and exciting discussion. In this paper, we describe graduate surgical education in the United Kingdom (UK), in Japan, and in Mexico. Table 1 provides comparative data of these training systems and contrasts them to US training.

Surgical Training in the UK

Present State

Medical students in the United Kingdom (UK) typically spend five to six years at medical school, entering around the age of eighteen after finishing secondary school. After medical school, all graduates must work for two years as Foundation Doctors to gain full registration as medical practitioners involving four to six month attachments in a variety of medical and surgical specialties. The decision to become a surgeon usually means application for core surgical training. Core surgical training is still a popular choice in the UK with a ratio of 2.56 applicants per available post.

Core training is two years of general professional surgical training comprising a wide range of surgical specialties with entry through a competitive national selection process. Core training has broad and basic learning objectives; successful completion of core training requires regular positive workplace based assessment and passing the Membership of the Royal College of Surgeons (MRCS) examination.

Upon completion of core training, most trainees apply for higher surgical training in one of the recognized surgical specialties. Higher surgical training programs are of 5-6 years duration. Again, entry into higher surgical training is by competition – most training programs now recruit through a benchmarked and validated system of national selection process, with 36% of core surgical trainees being successful on their first application.

The national selection process for both basic and higher surgical training has evolved to ensure that the selection process is fair, structured and transparent. All surgical specialties produce a person specification that provides a transparent blueprint for applicants to aspire to and selection panels to measure against. The selection process is similar to a series of Objective Structured Clinical Examination (OSCE) stations, where candidates are assessed on their

portfolios, communication skills, clinical skills and other attributes. Performances are measured using well-defined criteria, score sheets and interviewers are trained to maximize fairness, and the whole process is Quality Assured by lay and professional assessors.

Progression through higher surgical training is by a series of rotations, which usually last for one year each, in a variety of hospitals within a particular region. For each rotation, the trainee has an assigned educational supervisor whose job it is to set the learning goals for that trainees' experience and to ensure that they are met by the end of the rotation.

In the UK, all surgical training programs use an online portfolio – the InterCollegiate Surgical Curriculum Programme (www.ISCP.ac.uk). This contains the curricula for all the surgical specialties, and lays out exactly what is required of each trainee, in each specialty, for each year of training. All trainees and trainers are registered with the ISCP system, and the trainees use this online portfolio to gather evidence of their progress through the training program.

An annual review of competence progression (ARCP) takes place for each trainee at the end of every year. This is chaired by the relevant Training Program Director, and involves the specialty training committee who review each trainee's progress as recorded in their ISCP portfolio and ensure that trainees are progressing as expected. Trainees need to demonstrate positive progression in each year, by logging adequate numbers of operative cases, performing a variety of workplace based assessments, and recording these in the ISCP portfolio.

Satisfactory completion of the training program and passing the Fellowship of the Royal Colleges of Surgeons (FRCS) specialty specific examination results in the award of a Certificate of Completion of Training (CCT), which means that the trainee has acquired all the necessary competencies to practice independently and can apply for employment as a consultant

(attending). Unlike in the USA, there are no recognized Fellowship programs in the UK, but still up to two thirds of trainees will undertake some form of unofficial fellowship training, either in units in the UK or overseas.

Challenges

While the current UK training system has much to be proud of, there is room for improvement. Every year the UK General Medical Council, our regulatory body, undertakes a survey of all trainees in all specialties, and unfortunately, surgical trainees have the lowest satisfaction ratings with their training. (4) We are aware that much of that dissatisfaction lies within the early years of surgical training, particularly the core surgical training years. As these doctors are the most junior tier of surgical access, they tend to spend much of their time on call for emergency duties with the result that they spend little time in the operating room. Due to working time restrictions in the UK (doctors in training are limited to an average of 48 hours per week at work) they also tend to be on various patterns of shift work, so limiting their exposure to daytime training opportunities.

These data have brought into sharp relief the current challenges faced in UK surgical training. We have an imbalance between training and service provision. There is a lack of time for training generally, not only from the point of view of the trainees, but also from the viewpoint of the trainers. We have an inflexible training system – although it purports to be competency based it is in fact very firmly time based - and there is no leeway within the system for trainees who are progressing faster, or slower than expected. Additionally, there is no flexibility to allow trainees to change track and move from one specialty to another. (5)

Future Plans

Because of these shortcomings, Health Education England commissioned the Royal College of Surgeons of England (RCSEng) to identify where improvements could be made in surgical training and to lead a feasibility study into implementation of these improvements, which has produced the Improving Surgical Training (IST) pilot project. (6)

The IST project will trial reduced service commitment for the trainees in training programs. This will mean that the minimum on call frequency should be one in ten, thus maximizing daytime elective working and training. Achieving this will be difficult without changes to the existing workforce and will need the broad involvement of the wider surgical team, with investment in physician extenders. Physician Assistants or Associates are still rare in UK practice, but an ambitious expansion in this direction will be needed to free the trainees from front line duties and shift work to maximize their training.

The second strand of the IST project is to refine the actual process of training. While we have been producing surgeons of the highest caliber in the UK for decades, there is little disagreement that the process could be improved and streamlined. This will involve a move toward a truly competency based program of training, with trainees' progress dependent on demonstration of competence rather than simple time served. There will still be stipulated minimum (and maximum) durations for training, but trainees will be able to move through the program at different rates according to competency progression based on the use of

Further refinement of the training process will involve enhanced selection processes into training, in addition to the development of more specific and explicit targets for each stage of training. This will go hand in hand with improved annual reviews of progress, likely involving

an entrustment panel to oversee and assess progress. Also necessary will be improved use of simulation, both for technical and non-technical skills, and proper integration of that simulation into the specialty curricula and assessment systems, with increased use of boot camps at specific waypoints in the training program.

For this to work there will also have to be significant investment in faculty development. At present in the UK, as with most of the world, the role of the surgical trainer is a vital one, yet one that is often not recognized nor rewarded appropriately. Often training is seen as an activity to be performed in parallel with service delivery, with its requisite targets and emphasis on throughput. We are often almost tasked with training in our spare time. The Royal College of Surgeons of Edinburgh recognized this paradox and responded by founding the Faculty of Surgical Trainers (www.fst.rcsed.ac.uk) to promote and professionalize the role of the surgical trainer.

The Faculty are working with RCSEng in the IST project to ensure that faculty development is at the heart of the IST project. We need to ensure that trainers are properly selected and trained for their enhanced role. These trainers cannot be expected to do this job 'in their spare time'; they need adequate time and resources to enable them to train, and to develop as trainers. At present, attendance at a training the trainer type course is usually seen as a one-off exercise – but we see the need for recurrent trainer training and benchmarking of performance. Trainers need to be able to reliably differentiate between trainee levels of performance, and then drive the performance of that trainee toward that of the expert.

To this end, we have developed an Entrustable Professional Activity for trainers. As with the EPAs that are used to describe our trainee level of entrustment with a clinical task, this

describes what tasks, skills, knowledge and behavior we expect of a surgical trainer. This EPA clearly sets out what a surgical trainer should be doing and to what level, and is based on the previously devised 'Standards for Surgical Trainers' that were written by the Faculty of Surgical Trainers (7).

The Improving Surgical Training project is an exciting development in surgical training in the UK. This move toward an enhanced competency based model should enable more efficient and effective delivery of training. As with all training programs, its success will be very dependent on how and by whom it is delivered. The design and delivery of the faculty development program, and the innovative entrustable professional activity for trainers will be key to better training for our trainees, and ultimately improved care for our patients.

Surgical Training in Japan

Current State

Japanese medical students entering residency are required to complete a two-year structured postgraduate clinical training program after acquiring the National Medical Practitioners license. This program includes mandatory rotations in internal medicine, emergency, and community medicine. For those pursuing a surgical career, a core three-year surgical residency follows, after which, residents are eligible to take the certification examination of the Board of Surgery. Because of the absence of an accreditation council that can guide and oversee postgraduate surgical education, a total of 3,187 teaching hospitals (Japan Surgical Society Website: https://www.jssoc.or.jp/servlet/JssServlet) organize and

administer their own residency programs without guidance by a national body and in the absence of a standardized national curriculum.

To assess the state of surgical residency training in a large prefecture of Japan (Hokkaido with a population of 5.4 million) the authors recently conducted a survey of 72 residency programs.(8) Data from six university-based programs, 16 university-affiliated programs, and 14 community-based programs (50% of programs initially surveyed) showed that only 8.3% of the program directors were satisfied with their residency programs due to the lack of a functional curriculum, limited teaching time, and resources in their hospitals. Although 81% of the residency programs had program directors, most of them were engaged in educational work less than five hours a week. While 86% of the programs conducted academic or technical skill lectures such as case conferences, technical skill courses, and journal clubs, few of the lectures took place regularly during their clinical working hours. In addition, 44.4% of the programs had skill labs or simulation centers in their hospitals, but only two programs used simulators regularly for resident training. The most common simulator was a trainer box for the practice of laparoscopic suturing. Importantly, only 55.6% of the programs formally assessed resident performance and only 52.8% conducted program evaluations on a regular basis.

Challenges

Several challenges face surgical education in Japan. While Japanese surgeons have led the development of high-quality surgical treatments for patients (9,10), the rapid technological advances and introduction of multiple new procedures in surgery along with the new era of competency-based education in medicine necessitate steps to improve the effectiveness and quality of surgical education in the country. Despite the existence of a surgery board that

certifies surgeons, a national standardized residency curriculum and structure do not currently exist in Japan. Another challenge faced by the authors in their effort to disseminate good surgical practices to other institutions and standardize resident training, is the wide dispersion of training programs across their region (Hokkaido prefecture) that necessitates remote education. To address this issue the author's group has developed programs for remote training in basic and advanced laparoscopic surgery. For basic laparoscopic skills training a remote coaching system was developed that uses foldable laparoscopic trainer boxes (Tr-box, Chuo Name Plate©, Sapporo, Japan), laptops, free two-way conferencing software, and web-cameras. Using this approach 20 residents in 15 teaching hospitals have been successfully trained to proficiency in intracorporeal suturing using the Fundamentals of Laparoscopic Surgery (FLS) program. Over 90% of the residents who trained using this remote coaching system were satisfied.

For procedural training, the authors have developed a remote assessment and feedback system that initially targeted Laparoscopic Inguinal Hernia Repair (LIHR) with mesh by the Transabdominal Preperitoneal (TAPP) approach. To accomplish this, an assessment tool (TAPP checklist) for LIHR has been developed and validated (11) and instructional videos in the LIHR TAPP approach for resident use have been created. Using a telementoring approach similar to that for basic skills education, trainees who trained under the new educational system demonstrated significant improvements in overall performance and in important parts of the TAPP procedure compared to a control group demonstrating the effectiveness of this approach. (12)

Future plans

To address the aforementioned challenges, the Japanese Association for Surgical Education (JASE; http://www.surgicaleducation.jp) was established in 2014 along the lines of the Association for Surgical Education (ASE) with the mission to improve surgical education in Japan. The main goals of JASE include providing and sharing information related to surgical education, helping surgical educators develop teaching skills, developing a standard residency training program model and educational tools for surgery, and promoting research in surgical education. JASE holds annual meetings as Surgical Education Summit (SES) to promote its goals and spread best education practices in surgery; with over 70 participants and more than 20 presentations in 2017.

To address the lack of a common residency curriculum, a new process for accreditation of surgery residency programs will be initiated and managed by the Japanese Medical Specialty Board in April 2018. Further, significant more work is required to create a new, standardized, and effective surgical education system in Japan in collaboration with surgical societies and the Medical Specialty Board. In addition to standardizing the curriculum, the implementation of telementoring as described in the previous paragraphs for a variety of surgical procedures and across several institutions around Japan will be needed. Moreover, programs for faculty development of surgical educators have to be developed to improve their effectiveness as teachers.

Although only three years have passed since the establishment of JASE, we hope that JASE will continue to grow and play an important role in the field of surgical education and its activities help improve patient care and outcomes of surgery in Japan. We also hope that JASE

would cooperate with overseas societies such as the ASE to learn from each other and to globally impact surgical education.

Surgical Education in México

Present State

Becoming a surgeon in México is a daunting task. Every year after finishing medical school, around 20,000 young doctors apply for a position through the national residency program. Only 2000 spots are available and 661 (3%) of these are for general surgery.(13) In addition to the national exam, an aspiring surgical resident must search for a position in the desired hospital with no guarantee of acceptance.

The training model is moving from the traditional Halstedian apprenticeship model, to a more structured curriculum that reflects the current needs of the country and educational standards. Surgery training programs last four years, including a rural rotation, and emphasize graduate responsibilities and operative autonomy. In some settings, due to the lack of adequate personnel, surgical residents are required to operate on their own, particularly in general and rural hospitals where the availability of senior general surgeons may be limited. (14)

In 1976, the Mexican Board of General Surgery started a certification process of general surgeons in practice that currently is required to perform surgery in México. This represents a significant advancement toward training standardization by setting minimum standards for knowledge and procedures.(15) All residents completing general surgery training have to obtain

this certification. In addition, residents have to obtain passing scores on annual exams and complete a research thesis that they defend.

The increasing complexity of surgical procedures has also created a need for development of subspecialty training programs or fellowships. The National University of México sponsors subspecialty training and courses for hepato-pancreato-biliary (HPB), colorectal, vascular and bariatric surgery training programs. While there are no available data on the impact of these programs on surgeon practice, most practicing surgeons in Mexico have a case mix that combines common general surgery and subspecialty cases. Some subspecialty programs have their own certifying boards, as is the case for colorectal and vascular surgery, that standardize the quality of training and practice.(16)

Currently in our hospital, 40% of our surgical residents are women but only three of 22 staff surgeons are women. In a specialty traditionally dominated by men, this reveals the limited access to academic positions for women surgeons but also demonstrates the increasing enrollment of female residents in surgical residency programs.

Challenges

General surgery in México is practiced in three types of settings: high volume medical centers, general hospitals, and rural hospitals. Each of them have different needs and challenges. On the one hand, high volume medical centers employ highly specialized and skilled surgeons but face an overwhelming demand for surgical care and have limited resources available to cover this demand. On the other hand, general and rural hospitals struggle to attract and maintain skilled providers, and have unmet needs for adequate supplies and

equipment. A disorganized referral system plagued by limited availability of primary care services further complicates surgical practice.(17)

This fragmented health system leads to enormous variability in quality of care and education that makes also the application process to enter residency challenging. A centralized system, such as the national residency matching program (NRMP), would make the process more efficient and friendly to both medical centers and applicants, but this does not exist currently.(18)

Further, while thesis defense is required for graduation, is it unknown how many of these projects culminate in a peer reviewed publication. The lack of protected time for research and limited funding are the main challenges that need to be addressed to generate high quality research, relevant to the health needs of Mexicans.

Future Plans

Despite the challenges that México is continuously facing, Mexican surgeons keep fighting to improve their practice settings and provide the best possible care. More incentives are required by the government to assure surgical coverage in rural areas of Mexico, as most surgeons currently work in urban areas. Incentivizing surgeons to work in rural areas may help decrease geographical, socioeconomic and cultural inequities of access to surgical care and are likely to also impact surgical resident education.

Increasingly, there is also more attention placed on improving surgical training to produce safe and competent surgeons, limit attrition of residents and promote gender equality with the ultimate goal to benefit both the patient and the residents.

Discussion

In this paper, we presented the approach to surgical education in three different countries from three different continents. While differences clearly exist in the structure of surgical training and challenges faced among the three presented education systems, several similarities are worthwhile mentioning. The authors identified the importance of focusing on education over service and basing surgery residency training on solid, standardized curricula that incorporate objective forms of assessments and clear benchmarks for promotion. The presented data also highlight the need to increase the number of women trainees in surgery which still lags behind that of men across all countries and to implement work hour limitations for trainees across the globe according to similar guidelines.

For these goals to be achieved, additional resources and investment in surgical education are needed. The implementation of best evidence practices for effective training, existing guidelines for work hour restrictions of trainees, and strategies to limit implicit gender biases may help address existing needs. Further, the experiences obtained in more advanced education systems should be freely shared among educators in different countries and serve as a guide to those implementing new and tested approaches. The Association for Surgical Education may serve as a forum for the exchange of such ideas and experiences and promote international collaboration.

This overview may provide valuable input to surgical educators around the world and the ability to compare their education systems to that of several other countries. Understanding how education is approached in different areas of the world and the potential

advantages and disadvantages of each system, compared to surgical training in their own country, may help surgical educators further improve their practices.

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Table 1. Comparison of surgical training programs across the three countries

	US	United Kingdom	Japan	Mexico
Medical school duration	4 years	6 years	6 years	6 years
Residency duration	5 years	2 years core + 6 years surgical training	2 years core + 3 years general surgery	4-5 years
Number of residency programs	277	15	188	22
Number of general surgery residents	8086	1240	4,642	721
Resident selection process	National (exam and interviews)	National (exam scores and interviews)	Up to the individual hospital	National (matched based on exam score ranking, hospital interview)
Graduation requirements	Completion of training program, 850 cases (200 during chief year)	Completion of training program, Minimum numbers of index cases, annual review of competence progression	5-year residency and 350 total cases (120 primary)	Passing score on annual exams No case minimums Research thesis completion and defense Final oral exam
Working hours per week	80	48	No limits exist	No limits exist
Board certification (pass rate)	90%/79%*	85%	81.4%	73%
Number of residents pursuing fellowship	80%	70%	No fellowships exist	~ 60%
% female residents	40%	30%	20.3%	34.7%

* percentages for qualifying and certifying exams, respectively.

Highlights:

- Surgical training in the UK is making strides toward becoming competency based.
- Entrustable professional activities have been developed for trainees and for trainers
- The Japanese Association for Surgical Education is leading the change in surgical training
- All Mexican surgery residents also have to complete a research thesis to graduate